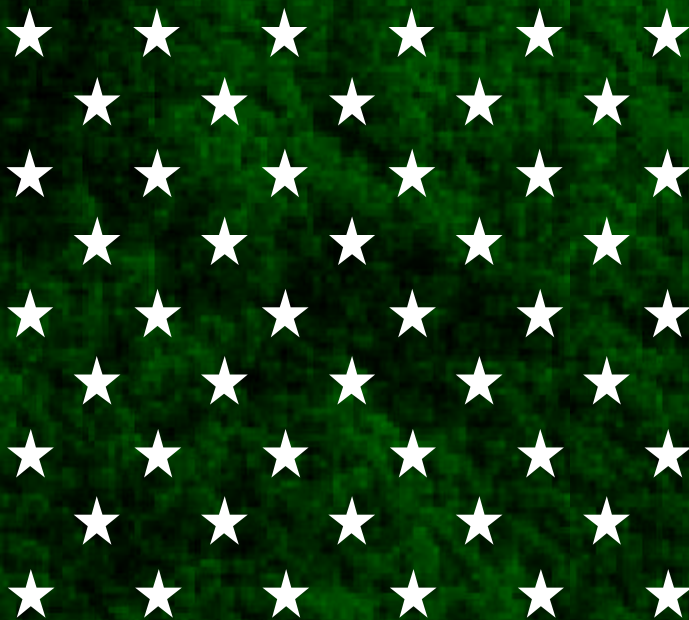




Emergency
Management
Program
Follow-up Review
at the

Lawrence Livermore National Laboratory



December 1999

**Office of
Independent
Oversight and
Performance
Assurance**

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Abbreviations Used in This Report

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| AMLS | Assistant Manager for the Livermore Site |
| CATS | Corrective Action Tracking System |
| DOE | U.S. Department of Energy |
| EAL | Emergency Action Level |
| ERAP | Emergency Readiness Assurance Plan |
| ISME | Integrated Safety Management Evaluation |
| LEDO | Laboratory Emergency Duty Officer |
| LLNL | Lawrence Livermore National Laboratory |
| OAK | Oakland Operations Office |
| SOC | Satellite Operations Center |

OVERSIGHT

Executive Summary

| | |
|--------------------|---|
| EVALUATION: | Independent Oversight Follow-up Review of the LLNL Emergency Management Program |
| SITE: | Lawrence Livermore National Laboratory |
| DATE: | December 1999 |

Scope

The U.S. Department of Energy (DOE) Office of Emergency Management Oversight, within the Office of Independent Oversight and Performance Assurance, conducted a follow-up review of the emergency management program at the Lawrence Livermore National Laboratory (LLNL) in December 1999. The purpose of this review was to determine the status of corrective actions taken to address weaknesses in emergency management program elements that were identified as needing significant management attention during the 1997 DOE Office of Oversight integrated safety management evaluation (ISME) and an April 1998 follow-up evaluation of the laboratory's progress in correcting those weaknesses. This review also examined the effectiveness of the Oakland Operations Office (OAK), the Office of the Assistant Manager for the Livermore Site (AMLS), and LLNL feedback and improvement management processes as mechanisms for identifying, analyzing, and addressing program deficiencies, implementing corrective actions, and demonstrating and verifying the effectiveness of those actions in improving the site's emergency response capability.

Background

The LLNL emergency management program was one of several environment, safety, and health disciplines reviewed during the Office of Oversight ISME, which was conducted from September through November 1997. The 1997 review

identified positive attributes of the LLNL emergency management program in the areas of initial responder facilities and equipment, mutual aid agreements and interfaces with offsite response agencies, the emergency management-related employee volunteer support organization, and continuing focus on reducing the types and quantities of hazardous materials on site. However, the 1997 review also found significant programmatic weaknesses in hazards assessments, emergency plan implementing procedures, categorization and classification, notifications, emergency responder training, and the LLNL assessment and corrective action management program. The result was that the LLNL emergency response organization was not prepared to assess an incident scene, categorize or classify the emergency, formulate worker and public protective actions, and notify offsite authorities promptly and accurately in an emergency.

A follow-up Office of Oversight visit to LLNL was conducted in April 1998 to evaluate the status of corrective actions taken to address the weaknesses identified in 1997. The 1998 evaluation found that LLNL was in the process of redesigning its emergency management program and had implemented some effective interim corrective actions. These included transferring responsibility for emergency classification and notification to the incident commander to ensure that these duties would be performed promptly, revising work control processes to facilitate development and validation of facility hazards surveys and assessments, and better program integration resulting from the redesign effort. However, the evaluation reiterated weaknesses in hazards assessments, implementing procedures for emergency classification and protective action decision-making, corrective action tracking and monitoring systems, and OAK oversight of the laboratory's emergency management program.

Results

LLNL has made some notable improvements in the site's emergency management system since the 1998 Office of Oversight follow-up evaluation.

Hazards surveys and facility-specific hazards assessments have been completed, incident commanders demonstrated that they clearly understand the immediate actions that must be taken in an emergency and are aware of the need for conservative decision-making, and LLNL purchased a computer system that can be used to quickly warn large populations of nearby residents of significant or emergency events; this system has been integrated into the Livermore city emergency response system. In addition to these improvements, program attributes that were previously identified as strengths, such as response facilities and equipment, offsite response interfaces, and employee volunteer networks that can provide valuable emergency response capabilities, have been well-maintained. Furthermore, the last two site emergency response exercises were conducted during non-duty hours to test the laboratory's ability to perform critical emergency response functions without the immediate staffing of the emergency management center.

The LLNL program has improved in each of the three areas identified as needing significant management attention in the 1998 complex-wide evaluation of DOE emergency management programs. These improvements are reflected in the ratings of Marginal for the three program elements addressed in this report. However, there are still fundamental program weaknesses that need to be addressed in order to provide assurance that the laboratory is capable of responding to an incident involving the actual or potential release of hazardous material. For example, the hazards assessment does not yet address potential emergencies resulting from malevolent threats or transportation activities, procedures or guidance for recommending public protective actions have not been established, predetermined protective actions lack sufficient specificity to be implemented in an emergency and are not supported by a technical basis, and the laboratory's policy for notifying offsite authorities of emergency events is not in accordance with DOE requirements and expectations. All but one of these weaknesses were identified during the previous two Office of Oversight evaluations, and some were also identified during LLNL internal assessments, but have not yet been corrected.

More fundamentally, there are several important factors that contribute to the laboratory's inability to achieve a comprehensive and integrated emergency response system. LLNL has not adequately defined the elements and structure of its emergency planning, preparedness, and response program components or the roles, responsibilities, authorities, and expectations

of the wide variety of laboratory organizations that must work together to implement an integrated and effective program. In addition, the feedback, improvement, and corrective action management processes have not been rigorous enough to correct weaknesses identified during previous assessments or site exercises and drills. Furthermore, DOE Headquarters, OAK, and AMLS have not set expectations for LLNL to improve the emergency management program and have not adequately monitored the laboratory's progress to ensure that corrective actions have been implemented and are fully effective. DOE has not routinely communicated with LLNL managers regarding program status or conducted any assessments of the LLNL emergency management program since 1996. There are no DOE performance measures related to emergency management, and the DOE corrective action verification and closure process has not been followed. As a result, several of the emergency management-related action items in the DOE Headquarters Corrective Action Tracking System are inappropriately identified as complete and verified. In addition, DOE and LLNL did not develop any additional corrective actions, refine existing corrective action plans, or validate the adequacy of their progress to date as a result of the information provided in the 1998 Office of Oversight follow-up evaluation and a September 1998 LLNL internal assessment that reported on the status of those corrective actions.

As a result of the weaknesses in the DOE and LLNL feedback and improvement programs, LLNL incident commanders have not been provided the necessary procedures, training, or guidance to accurately and promptly carry out their duties of incident scene assessment, emergency classification, formal notifications, and formulation and implementation of protective actions in an emergency. Although the laboratory's initial response capability has improved with the transition of these time-critical duties to the incident commanders, the responders are handicapped by incomplete emergency action levels, inadequate predetermined protective actions, and substandard notification forms.

Conclusions

LLNL has continued to work toward improving the site's emergency preparedness and response capability. Improvements in the hazards assessments, programmatic structure for categorization and classification and emergency notifications, and the demonstrated

capabilities of LLNL incident commanders have enhanced the laboratory’s initial response capability. However, the continued presence of fundamental program weaknesses that were identified during previous internal and external assessments indicate that the DOE and LLNL feedback and corrective action management programs have not been effective and that appropriate attention has not been directed toward identifying the root causes of these weaknesses. A significant contributor to these weaknesses is the lack of a clearly defined laboratory-wide emergency management system that integrates all of the needed program elements and is supported and understood by all of the line managers

that must participate in the program in order for it to be effective. Another significant contributor is that DOE did not adequately monitor and respond to the slow program progress or set expectations and deadlines for needed programmatic improvements. Additional management attention from both DOE and LLNL is needed to ensure that basic program elements are implemented in accordance with DOE Order 151.1, *Comprehensive Emergency Management System*, and are verified to be effective in preparing laboratory personnel to respond to the range of potential emergencies such that adequate protection of site personnel and the public is assured.

| FINDINGS |
|--|
| <p>As directed by the Office of the Secretary of Energy, DOE has established a process for recording, tracking, addressing, and resolving findings identified by the Office of Independent Oversight as defined by the <i>Protocols for Responding to Office of Independent Oversight and Performance Assurance Appraisal Reports</i> (August 1999). The DOE Assistant Secretary for Defense Programs, as the cognizant secretarial officer, and the DOE field element (OAK), as the cognizant line manager, are required to develop a corrective action plan to address the findings identified in this report.</p> |
| <ol style="list-style-type: none">1. LLNL assessment and corrective action management programs have not ensured that previously identified emergency management program weaknesses have been successfully addressed and corrected.2. OAK and AMLS have not adequately monitored LLNL progress in improving the laboratory emergency management program, communicated expectations for program quality and improvement, or held the laboratory accountable for improving the program and correcting previously identified weaknesses.3. The LLNL emergency planning, preparedness, and response program elements have not been adequately defined and integrated into a management system that ensures effective implementation and an appropriate level of management attention and support.4. LLNL emergency response procedures and decision-making resources do not provide adequate definition or instruction for initial responders to promptly and accurately categorize and classify an emergency, and formulate and implement protective actions.5. The LLNL emergency notification process does not ensure that DOE Headquarters and offsite agencies are promptly notified of essential emergency information and is inconsistent with DOE Order 151.1 requirements. |


The legacy issue below is from DOE Headquarters' Corrective Action Tracking System and reflects the weaknesses that were identified during the 1997 Office of ISME related to emergency management. The issue

description is accompanied in the tracking system by 11 action items, nine of which are identified in that system as complete and verified.

OPEN LEGACY ISSUE

The hazards analyses that support the LLNL emergency management program, including methodology, scope, and documentation, are not performed with sufficient rigor to ensure that the laboratory is able to respond to the full spectrum of potential operational emergencies. LLNL has not established formal work processes, methodologies, or procedures to govern the conduct of these analyses. Sitewide processes are not formally linked to facility source documents, such as safety analysis reports and process hazards analyses. The Emergency Plan Implementing Procedures are outdated and inconsistent with existing requirements and site conditions, some procedures are not sufficiently detailed to ensure that emergency managers can perform time-sensitive response to off-normal events, and some procedures have not been reviewed and approved by DOE as required.

1.0 Introduction




The Office of Independent Oversight conducted a follow-up review of the emergency management program at the Lawrence Livermore National Laboratory.

The U.S. Department of Energy (DOE) Office of Emergency Management Oversight, within the Office of Independent Oversight and Performance Assurance, conducted a follow-up review of the emergency management program at the Lawrence Livermore National Laboratory (LLNL) in December 1999. The purpose of the review was to determine the status of actions taken to correct emergency management program deficiencies that were identified during the September through November 1997 Office of Oversight integrated safety management evaluation (ISME) and an April 1998 follow-up evaluation conducted by the Office of Oversight. This December 1999 review focused on corrective actions related to weaknesses in hazards assessments; emergency action levels (EALs); protective action formulation; emergency plan implementing procedures, DOE and LLNL assessment and corrective action management programs; and training, drill, and exercise programs.

The DOE Office of Science is the lead program secretarial office for the Oakland Operations Office (OAK). The DOE Assistant Secretary for Defense Programs is the cognizant secretarial officer responsible for laboratory operations. These responsibilities are defined in a memorandum of agreement among the two Headquarters offices and OAK, which manages activities at LLNL and several other DOE sites. The Office of the Assistant Manager for the Livermore Site (AMLS) provides day-to-day management at the site, which includes direction regarding the laboratory

emergency management program. The University of California manages LLNL operations as a not-for-profit research institution.




A 1998 follow-up review found that while some weaknesses identified in 1997 had been addressed, the lab still needed to strengthen its corrective action management program.

The 1997 ISME concluded that significant management attention was needed to achieve a comprehensive and effective emergency management program at LLNL. Specific weaknesses were identified in the areas of hazards assessments, emergency response organization structure, emergency plan implementing procedures, procedure use and adherence, categorization and classification, protective actions, training, and assessment and corrective action management programs. The 1998 follow-up review was conducted to determine the status of the weaknesses identified in 1997. It concluded that LLNL was in the process of redesigning its emergency management program and that several positive changes had occurred as a result of these efforts. However, that evaluation also identified that several of the weaknesses had not been and were not being adequately addressed and corrected. Furthermore, the evaluation indicated that continuing weaknesses in the LLNL corrective action management process and the DOE program for monitoring and evaluating the laboratory did not ensure that corrective actions would be implemented effectively or that line managers would be held accountable for their implementation.

2.0 Results

The evaluation addresses areas included in DOE Order 151.1, *Comprehensive Emergency Management System*, the results of the 1998 complex-wide review of emergency management programs, and existing OAK and LLNL corrective actions selected for review. Each section includes key observations, conclusions, and a rating of Satisfactory, Marginal, or Unsatisfactory. These ratings are used to communicate the effectiveness of corrective action implementation and to provide a perspective on where line management attention is warranted. Appendix B provides a more detailed explanation of the rating system.

Feedback and Continuous Improvement Process



This follow-up review concluded that LLNL has completed a hazards survey and facility-specific hazards assessment, improved LEDO training, and redefined some incident commanders' responsibilities.

The 1997 ISME identified a number of significant deficiencies in the LLNL emergency management program. This 1999 follow-up review determined that some of the major deficiencies originally identified in 1997 have been adequately addressed and there is evidence of some progress toward addressing other deficiencies. For example, LLNL has completed a hazards survey and facility-specific hazards assessments, improved training for the laboratory emergency duty officers (LEDOs), and transferred responsibility for initial decision-making, emergency classification, and notifications to LLNL incident commanders. The 1997 ISME also identified weaknesses in LLNL's feedback, assessment, and corrective action management programs and found that OAK was not fulfilling its required role of overseeing the LLNL processes for developing and maintaining a comprehensive emergency management system. The 1998 Office

of Oversight follow-up visit identified that LLNL management systems for capturing evaluation and assessment information and tracking and implementing corrective actions still needed improvement, and that OAK still had not developed a structured program to monitor and review the LLNL program. However, there are still significant weaknesses in the LLNL emergency management program that are clearly linked to deficiencies in the OAK and LLNL feedback, improvement, and corrective action management programs and inadequate consideration of the results of several previous internal and external evaluations of the LLNL program.

The Independent Oversight evaluation team used the results of the 1997 ISME, the 1998 Office of Oversight follow-up review, a May 1995 assessment report of the LLNL emergency management program conducted by emergency management personnel from the Los Alamos National Laboratory, and a September 1998 LLNL Annual Internal Readiness Assurance Assessment to evaluate the effectiveness of the LLNL feedback and improvement process. The September 1998 LLNL internal assessment provided a status report of the corrective actions that had been implemented to date in response to the 1997 ISME and a November 1997 assessment by Savannah River of the LLNL program. The last quarterly report for the Safety Management Evaluation Corrective Action Plan identifies the status of all actions taken to correct deficiencies in the LLNL emergency management program that were identified during the 1997 ISME as closed. However, the results of this 1999 evaluation and the information gleaned from the other assessment reports indicates that many previously identified weaknesses have not yet been addressed or corrected. Weaknesses or concerns that have been previously identified but not corrected, and the dates of the reports that they are identified in, include:

- The emergency plan and hazards assessment do not reflect a planned response for all types of incidents, including fires, facility operational

events, and security events (May 1995 assessment report, 1997 ISME, and May 1998 Office of Oversight follow-up)

- There are no EALs for security incidents (May 1995 assessment report, 1997 ISME, May 1998 Office of Oversight follow-up)
- Hazards resulting from onsite transportation events have not been assessed for their potential impact on site personnel or the public (1997 ISME, May 1998 Office of Oversight follow-up)
- LLNL emergency plan implementing procedures lack sufficient specificity to support accurate assessment, emergency classification, and protective action formulation (1997 ISME, May 1998 Office of Oversight follow-up, September 1998 LLNL internal assessment)
- Potential General Emergency scenarios have not been incorporated into emergency planning and response documents (1997 ISME, September 1998 LLNL internal assessment)
- The option of sheltering does not appear to have been considered as a protective action although it may be appropriate in some cases (1998 Office of Oversight follow-up)
- A work plan, methodology, or procedure for performing hazards assessments has not been established (1997 ISME, May 1998 Office of Oversight follow-up)
- There is no mechanism to ensure that significant changes in hazardous materials or processes are communicated to personnel responsible for the hazards assessment to ensure that they have been appropriately analyzed (1997 ISME, September 1998 LLNL internal assessment)
- The LLNL Emergency Management Corrective Action Plan is not tracking all of the concerns identified in the 1997 assessments (May 1998 Office of Oversight follow-up, September 1998 LLNL internal assessment)
- Program assessments have not resulted in effective implementation of corrective actions (1997 ISME, 1998 Office of Oversight follow-up)

- Although measurement and consequence assessment modeling capability are available at the incident scene, they are not being used to improve classification accuracy (1997 ISME, September 1998 LLNL internal assessment)
- OAK programs and processes have not been fully developed to ensure that LLNL emergency management systems are appropriately reviewed for effective program implementation (1997 ISME, 1998 Office of Oversight follow-up).

Subsequent to the 1997 ISME, LLNL took several actions to capture the weaknesses identified in the emergency management section of the associated field report and to identify planned corrective actions. These actions included:

- Entering the four “opportunities for improvement” listed in the field report into the LLNL laboratory-wide tracking system (DefTrack) with associated actions items and assigned responsible individuals,
- Entering eight corrective actions into a database established by the Office of the Deputy Director for Laboratory Operations that is being used to track the status of all of the actions being taken in response to the ISME report, and
- Establishing a separate “corrective action plan” that was submitted to OAK in response to requirements stemming from Defense Nuclear Facilities Safety Board recommendation 98-1.




Corrective action plans lack sufficient detail to ensure that all deficiencies originally identified will be corrected.

None of these efforts to capture and address the weaknesses in the emergency management program provided sufficient detail to ensure that all of the deficiencies originally identified would be corrected. For example, with regard to the weaknesses in the hazards assessment, the corrective action was to “conduct the hazards assessment.” LLNL has reported that the hazards assessments were completed and validated, and the office of the AMLS has modified the DOE Headquarters Corrective Action Tracking System (CATS) to indicate that this item is closed and verified. However, the hazards assessment still does not consider

the impact of transportation incidents or security events. In another example, LLNL corrective action plans indicate that protocols for performing hazards assessments and developing EALs were established and submitted to OAK. The DOE CATS indicates that the LLNL protocols were reviewed by DOE and found to be acceptable, but that the protocols have become unnecessary since the rewrite of the laboratory emergency plan and implementing procedures, which provide for formal implementation of the protocols. The existing emergency plan and implementing procedures reviewed by the evaluation team do not reflect any such protocols or procedures for hazards assessment development.

As indicated above, both the 1997 ISME and 1998 follow-up evaluation identified weaknesses in corrective action tracking and completion. The inconsistency between LLNL's assertion that almost all of the corrective actions for the 1997 ISME have been completed and the status of these weaknesses as observed by the evaluation team, i.e., that many of the items have not yet been corrected, indicates that the corrective action management program is still not functioning effectively. For example, LLNL managers didn't use the 1998 Office of Oversight follow-up report to benchmark whether corrective actions already implemented were fully effective or whether existing corrective actions adequately captured the weaknesses that had not yet been corrected. Furthermore, an August 1999 LLNL self-assessment designed to improve "overall readiness and capabilities to respond to and manage an Operational Emergency" did not identify any concerns or weaknesses in the LLNL program.




The results of drills are not formally documented to identify performance trends or share lessons learned.

Within the LLNL emergency management division, exercises, drills, and annual self-assessments are the mechanisms available to self-identify opportunities for programmatic and performance improvements. In the past, the deficiencies and weaknesses identified during these activities were captured and tracked in a database operated by the emergency management division. This system is no longer used as the laboratory transitions to a process wherein corrective actions related to the emergency management program are entered into the laboratory-wide system (DefTrack) for tracking. For example, the site plans to enter the weaknesses

identified during the June 1999 emergency response exercise into this system. However, almost six months later, this has not yet been accomplished and specific individuals have not yet been assigned responsibility for addressing and correcting the identified weaknesses. Furthermore, the "improvement items" and suggested corrective actions identified following emergency response exercises are not formally transmitted to the individuals who would be responsible for addressing them and there is no formal management direction to address these items. The results of the drills that are conducted as learning opportunities for emergency response organization members are also not formally documented. As a result, the information that could be derived from periodic drills is not being captured or analyzed to ensure that performance weaknesses related to program elements or implementing procedures are effectively addressed and do not recur.

FINDING: LLNL assessment and corrective action management programs have not ensured that previously identified emergency management program weaknesses have been successfully addressed and corrected.



The OAK and AMLS processes for managing issues and corrective actions did not ensure that the emergency management weaknesses identified in 1997 and 1998 were successfully corrected or resolved.

The OAK and AMLS processes for managing issues and corrective actions also did not ensure that the emergency management weaknesses identified in 1997 and 1998 were successfully corrected or resolved. The primary mechanism that AMLS uses to monitor and oversee LLNL programs is through "operational awareness" activities that consist mainly of periodic, informal surveillance-type activities such as interactions with contractor personnel and document reviews. The process includes specific requirements for recording, tracking, and trending of observations resulting from operational awareness activities. Although this process as presently designed could provide an appropriate level of oversight, it is not being implemented effectively in the area of emergency management. Some important operational awareness activities have not been completed as scheduled, and, other than generating comments from reviews of a few LLNL program

documents, none of the activities conducted to date have been documented as required by the Operational Awareness Implementation Plan. Although this implementation plan contains a list of operational awareness activities completed during the previous quarter, it does not reflect the results of those activities, and there is no evidence to indicate how or whether the results of these activities were discussed with or communicated to LLNL managers or counterparts.

The AMLS procedure on issues management identifies most of the necessary program elements of an effective corrective action management process, including requirements for corrective action plan development and approval, and tracking and closure of corrective actions. This procedure is not being rigorously followed and it does not clearly indicate that verification of corrective action closure includes a determination of the effectiveness of the action after it has been implemented. As a result, the rigor applied to closing items identified in the DOE CATS from the 1997 ISME was not adequate. For example, an action item related to the hazards assessment has been closed based upon LLNL's submittal of the assessment to DOE. However, DOE did not verify that the original weaknesses regarding the hazards assessment had been adequately addressed or provide a response to LLNL indicating that the hazards assessment was not complete or adequate. Furthermore, OAK and AMLS have not conducted any formal assessments of the LLNL emergency management program since 1996 to ensure that the laboratory's emergency response system is functioning effectively. As a result of these programmatic and performance weaknesses, OAK and AMLS have not provided accurate, consistent, and appropriate feedback to LLNL managers and have not adequately communicated their expectations for improvement in the laboratory emergency management program.

FINDING: OAK and AMLS have not adequately monitored LLNL progress in improving the laboratory emergency management program, communicated expectations for program quality and improvement, or held the laboratory accountable for improving the program and correcting previously identified weaknesses.

In conclusion, the Independent Oversight team found that there has been some improvement in each of the three areas identified in the 1998 Complex-wide Evaluation of Emergency Management Programs as needing significant management attention. These

improvements are reflected in the following three sections of this report. However, numerous emergency management program deficiencies identified in that report and other assessment reports have not been addressed or corrected, and are not reflected in any existing corrective action plans. Furthermore, OAK and AMLS have not adequately monitored LLNL's efforts to improve the laboratory emergency management program and have not set expectations for program quality and improvement and communicated these expectations to senior LLNL managers.

Rating: Unsatisfactory




Hazards Survey and Hazards Assessment

A hazards assessment completed in November 1999 does not yet include all potential emergencies and is not always consistent with hazard information contained in other site documents.

The 1997 ISME found that the LLNL hazards assessment did not have a documented technical basis, lacked many of the essential elements of a hazards assessment, and did not evaluate all known hazards or potential event initiators. The 1998 Office of Oversight follow-up review noted that appropriate attention was being directed toward upgrading the hazards assessment. Formal training in the form of a hands-on workshop was provided to select staff who were well-qualified to execute the assessment process and early results indicated that the revised assessment would provide the basis upon which a sound emergency management system could be structured. As a result of the efforts begun in early 1998, a hazards survey was completed in May 1999, although not yet approved, and the hazards assessment was completed in November 1999. However, the hazards assessment does not yet include all potential emergencies and, in some cases, is not consistent with hazard information contained in other site documents.

The LLNL hazards survey addresses all facilities and activities at the laboratory, including the main laboratory site and the remote Site 300. The survey results were tabulated into a form that facilitates easy use by emergency planners and responders and includes pertinent information such as facility type, occupancy,

and potential emergencies that could affect the facility. The laboratory used a conservative threshold to determine the quantities of material that required further assessment, i.e., quantities of material greater than 25 percent of the applicable regulatory planning threshold required further assessment. For chemical hazards, the LLNL ChemTrack database, facility walk-throughs, and discussions with facility personnel were used to identify the baseline chemical inventory. For radiological hazards, the hazards assessment group developed a database of radioactive material inventories from existing safety basis documentation, actual facility inventories, and facility walk-throughs.




The results of the hazards survey determined that 36 LLNL facilities and three chlorine treatment areas required a hazards assessment because of the quantities of hazardous materials in those areas.

The results of the hazards survey determined that 36 LLNL facilities and three chlorine treatment areas required a hazards assessment due to the quantities of hazardous materials in those facilities and areas. To the extent possible, information from existing safety basis documents was used to develop the hazards assessment for emergency planning and preparedness. The hazards assessment provides a crosswalk that references the location of information, such as descriptions of facility operations and hazards, which was derived from the safety basis documents. Information that is required in a hazards assessment but was not available in safety basis documents, such as the amount of hazardous material at risk, how the material is used, and the administrative controls and engineered barriers designed to prevent a release, has been developed and is documented in the hazards assessment. The current hazards assessment provides a consequence analysis for only three postulated accident scenarios – a great earthquake causing a building collapse and fire that impacts the entire facility inventory; a moderate earthquake that impacts the complete inventory of one room plus the next single largest container of hazardous material; and an industrial accident, such as a spill from mishandling of the material. These scenarios do not encompass the full range of initiating events that could occur or correlate the results of the completed analysis to all potential initiating events. The potential impact of initiators such as manufacturing defects, equipment malfunction, malevolent acts, fire, explosion, and vehicle

crash (including aircraft) have not been evaluated in the hazards assessment. As a result, a complete set of EALs has not been developed. The only EALs available to classify an emergency at LLNL are related to earthquakes resulting in either major or minor damage and spills or leaks of hazardous material. In addition, there are no compensatory measures to indicate, for example, that a fire could be classified using the major earthquake EAL and that the classification would be quite conservative due to the technical basis upon which the EAL was established.

The hazards survey also references some potentially severe emergencies that were not analyzed in the hazards assessment. The survey identifies a March 1997 LLNL Emergency Response Guide for Radiological and Toxicological Sabotage that addresses malevolent acts. This guide postulates several scenarios for several different laboratory facilities that could cause a General Emergency, but were not analyzed in the current hazards assessment and are not included in existing emergency planning and preparedness documents. Malevolent acts have not been evaluated or analyzed in the hazards survey and assessment process and the laboratory does not currently have any EALs that would cause a General Emergency to be declared. If the information in this guide is accurate, the consequences of the events described could be significant and could readily impact the citizens that reside in close proximity to the laboratory. The size of the existing emergency planning zone would need to be re-evaluated and EALs would need to be established for conditions that could result in a General Emergency. Although this deficiency was identified during the 1997 ISME, no action has been taken yet to refute the information provided in the guide or to plan and prepare for the possible consequences of the hazards and accident scenarios identified therein.



Predetermined protective actions for site personnel have not been established for hazardous materials that could be released from nearby non-DOE facilities.

The hazards survey identified three non-DOE facilities off site but near enough to the laboratory that site personnel could be affected by a chemical release (chlorine, ammonia, or toluene-2, 4-diisocyanate) from one of these facilities. Although the survey documents the extent of the potential hazard from these facilities, as well as transportation events involving chemicals related to these facilities, the laboratory has not established any predetermined protective actions

to ensure that site personnel would be protected if they are notified of an offsite incident involving these hazardous materials.

Another concern that was identified during the 1997 ISME but has not been addressed is the lack of a mechanism to notify personnel with responsibility for performing the hazards assessment before any significant changes occur in hazardous material inventories, or processes and activities that use hazardous materials. As a result, personnel responsible for maintaining the hazards assessment may not be aware of changes in facility hazards, activities, and processes that could impact the emergency management program, particularly if the change does not trigger some other form of safety review, such as the unreviewed safety question process. Additionally, LLNL has not established a requirement to periodically review the hazards assessment to ensure that it remains up-to-date and reflects actual site hazards.

In conclusion, LLNL has completed a hazards survey for all laboratory facilities and has made significant progress in performing quantitative hazards assessments for facility hazards and operations. However, not all site hazards and potential accident initiators have been evaluated or assessed, and there are indications that some of these initiators could have offsite consequences for which the laboratory is not prepared to respond. LLNL also lacks a mechanism to ensure that emergency planners are notified in advance of significant changes in facility hazardous material inventories, processes, and activities to ensure that such changes are covered by the existing hazards assessments or are further evaluated when necessary.

Rating: Marginal 

Program Administration, Plans, and Procedures

The 1997 ISME identified that emergency plan implementing procedures and the organizational structure for emergency response decision-making did not provide the means to accurately assess an event scene, formulate appropriate protective actions, categorize or classify an emergency, and promptly perform the required notifications. The 1998 Office of Oversight follow-up review found that the responsibility and authority for these critical initial actions had been transferred from the LLNL emergency management team to the fire department incident commander for events involving hazardous materials. A similar transition of responsibilities to the shift security officer for security-related emergencies was under

consideration in 1998 and has since been completed. The 1998 review also identified that EALs had improved, but many of them were still too subjective to be consistently implemented as written. This 1999 evaluation determined that several weaknesses in the LLNL emergency plan, implementing procedures, and decision-making resources still exist. These weaknesses can be attributed to the fact that there is not sufficient management span of control over several technical disciplines to effectively orchestrate a comprehensive and integrated laboratory-wide program.

The emergency management program at LLNL is largely expert-based and is not well-supported by documented methodologies and procedures.

The procedures formally designated as Emergency Plan Implementing Procedures are a small subset of a widespread and diverse mix of other procedures and expert-based systems that are intended to implement the LLNL emergency plan. LLNL personnel are generally familiar with their emergency management and response-related duties and the system components available to them to perform these duties. However, the overall emergency management system at LLNL is largely expert-based and is not well-supported by documented methodologies and procedures that ensure that the system can function effectively to support an emergency response effort under all conditions. For example, most emergency response support functions such as public affairs and consequence assessment are conducted in Satellite Operations Centers (SOCs) that are staffed in an emergency. A review of the plans and procedures for these centers identified that they vary substantially in quality, detail, control, and ease of application. The Environmental Protection Department SOC Operations Manual is excellent and rigorously controlled. On the other hand, SOC procedures for the hazards control and public affairs organizations are less detailed and many of them are not formally controlled. There is no comprehensive index of emergency response procedures. Furthermore, there is no established mechanism to ensure that these procedures are reviewed periodically, revised when necessary as a result of findings identified during drills, exercises, or assessments, and remain compatible with procedures used by other SOCs or the emergency management team. Responsibilities and authorities for developing and maintaining the overall emergency

management system for the laboratory, including the response centers and programmatic requirements such as hazards assessments, have not been adequately defined. This is especially critical since so many LLNL managers and organizations must work together to support a comprehensive program and to ensure an effective, integrated response capability.

FINDING: The LLNL emergency planning, preparedness, and response program elements have not been adequately defined and integrated into a management system that ensures effective implementation and an appropriate level of management attention and support.

At the incident command level, emergency plans have been revised and responsibilities reassigned to ensure timely decision-making when the emergency management center cannot be immediately staffed.

At the incident command level, emergency plans have been revised and responsibilities reassigned to provide for timely decision-making when the emergency management center cannot be immediately staffed and activated. The roles, responsibilities, and authorities for initial incident assessment, formulation of protective actions, and emergency classification and notification are assigned to individuals who are on site or near site 24 hours per day and who can quickly deploy to an incident scene. However, formal procedures or controlled job aids have not been developed to define how these duties are expected to be performed and to ensure that they will be effectively executed. For example, the tables of facility-specific EALs resulting from the hazards assessment are not formally controlled and the tables used by one incident commander during performance tests were missing some EALs. But as noted previously, EALs are not available for many potential emergency conditions and there is no guidance for applying the existing EALs to observed conditions in order to determine an appropriate emergency categorization or classification. For example, security incident commanders have no mechanisms to classify security-related events based on their potential to cause a hazardous material release. Fire department incident commanders have not been provided procedures or tools for classifying onsite transportation events either by applying the fixed-facility EALs or by using the

North American Emergency Response Guide. Other concerns were noted with classification tools. There are no discretionary EALs available to classify emergencies. In addition, the EAL tables were recently modified without an established technical basis. The facility EAL tables provided separate entries for hazardous material releases depending upon whether the event occurred during the day or at night in order to account for the effect on dispersion characteristics. However, all of the daytime EALs were removed from the fire department classification guides in an effort to simplify classification decision-making. Although this action would result in conservative classifications, the diminished accuracy of the classifications is unwarranted and could result in undue alarm concerning the severity of an incident.

An implementing procedure for formulating protective actions also has not been prepared. As documented in the 1998 Office of Oversight follow-up evaluation, the EAL tables include generic instructions such as “Protect to 105 meters downwind” and “SCBA to 65 meters downwind” for each emergency class. There are no procedures or guidance for determining what type of protective action is appropriate, e.g., sheltering or evacuation, based upon the characteristics of the release (instantaneous or continuous, gaseous or particulate). To aid in determining the “dimensions” of the downwind protective action distance, a facility-by-facility, event-specific matrix of affected site areas based upon wind direction has been prepared and is included with the EAL tables. However, the matrix incorrectly states, “evacuate block ...” as the protective action of choice for all events, and no guidance accompanies the matrix to indicate circumstances when evacuation is not to be implemented. If implemented as stated, the action could, in some cases, unnecessarily expose site personnel to a greater concentration of hazardous materials than sheltering in place. An investigative effort is under way to determine the appropriate protective action response based upon facility-specific factors such as ventilation exchange rates and the ability to shut down ventilation systems in a timely manner. In addition, the need to establish an isolation zone (circular area surrounding release point within which unprotected personnel are not permitted) is not specified in any response documents. In a related matter, emergency management staff was notified in November 1999 that “the Protective Force Division is currently not capable of meeting the performance expectations of the laboratory’s emergency evacuation plan.” Adequate compensatory measures have not been implemented to ensure the safety of site personnel if an emergency evacuation is required. Specifically, adequate evacuation traffic control is not defined by an integrated

procedure, and qualified personnel have not been designated to carry out this function.

FINDING: LLNL emergency response procedures and decision-making resources do not provide adequate definition or instruction for initial responders to promptly and accurately categorize and classify an emergency, and formulate and implement protective actions.

LLNL has not established an appropriate notification process that assures prompt notification of DOE Headquarters and other offsite agencies in the event of an Operational Emergency.

LLNL has not established an appropriate notification process that assures prompt notification of DOE Headquarters and other required offsite agencies in the event of an Operational Emergency. LLNL has established Agreements for Emergency Notification with the City of Livermore and Alameda County that specify that these agencies will be formally notified of an incident only if it is classified at the Site Area or General Emergency level. Although the EALs identify the potential for Alert and Site Area emergencies at the remote Site 300, a similar documented agreement for making formal notifications only at the Site Area and General Emergency levels, as is LLNL protocol, has not been established with San Joaquin County, which is adjacent to Site 300. These agreements do not comply with DOE Order 151.1 requirements for emergency notifications, and an exemption from the order was not requested. OAK inappropriately approved the LLNL emergency plan that reflects this notification arrangement, with the following comment for inclusion in the next revision of the plan (scheduled for April 2000): the notification and communications section "...does not appear to reflect the full range of other applicable notification requirements."

There are no procedural requirements or preformatted expectations to communicate critical supplementary information regarding an emergency.

Under the present process, the incident commander only notifies the local authorities and the OAK Watch

Officer that a Site Area or General Emergency has been declared. There are no procedural requirements or preformatted expectations to provide critical supplementary information regarding the emergency. For example, the notification form does not indicate whether a hazardous material release is in progress, has the potential to occur, or has stopped, does not identify what support has been requested from offsite authorities, and does not identify what protective actions have been implemented or recommended. LLNL passively relies on local, offsite agencies to acquire the critical information pieces required to perform emergency management decision-making from the numerous recorded communications in the centralized dispatch center, rather than proactively collecting and transmitting the information. Furthermore, the LLNL emergency plan documents that OAK will perform notifications to DOE Headquarters, but the OAK Operations Duty Officer Plan and Procedures does not identify this requirement. Thus, mechanisms are not in place for OAK to perform DOE Headquarters notifications on behalf of the contractor for any Operational Emergency. As a result, it is unclear how the laboratory can ensure that local offsite agencies are adequately informed of specific factors required for public protective action decision-making in the event of a hazardous material release at the site, and that OAK, AMLS, and DOE Headquarters are promptly notified and kept informed of emergency response actions implemented by the contractor.

FINDING: The LLNL emergency notification process does not ensure that DOE Headquarters and offsite agencies are promptly notified of essential emergency information and is inconsistent with DOE Order 151.1 requirements.

As part of this evaluation, hypothetical scenarios were developed for incidents that could occur at LLNL. The scenarios were presented to four LLNL incident commanders – two from the fire department and two from the protective forces – to test their ability to assess a postulated event and to formulate and implement the time-urgent decisions that are required in the initial stages of a response effort. The incident commanders were encouraged to make use of all reference materials and resources that would normally be available to them in responding to an incident or emergency. LLNL provided a previously qualified incident commander during planning and presentation of the scenarios to ensure clear communications using site-specific

terminology and to help validate the observations of the evaluation team.

The LLNL incident commanders who were tested demonstrated good familiarity with their roles and responsibilities as the sole decision-maker during the early stages of an event, and readily took actions to activate additional resources and obtain assistance for situations that could not be mitigated or controlled immediately. All four incident commanders made appropriate decisions to protect their response teams. For example, security incident commanders ordered the use of alternate communication systems instead of radios due to the potential presence of an explosive device, and the fire department incident commanders adhered to the “two in, two out” rule for ensuring appropriate rescue capability if the initial entry team becomes injured or lost. The incident commanders generally made use of available response procedures and informal checklists, but in some cases, they were not used effectively. For example, two of the incident commanders – one from the fire department and one from the protective forces – did not adequately consider the meteorological conditions when deploying response assets. As a result, incorrect response actions were implemented, such as:

- Responders were not instructed as to safe approach paths to the incident scene,
- The initial position of the incident command post placed assets downwind of a potential hazardous material release, and
- Adequate protective actions for affected site personnel were not implemented due to misinterpretation of the wind direction.

The fire department responder checklist addresses the subject of approach path relative to wind direction, but security procedures do not consider the potential for a hazardous material release as a result of a security threat.

Both of the fire department incident commanders categorized and classified the postulated event in an accurate, timely manner and promptly initiated offsite notifications. However, as a result of the deficiencies described above, the notifications did not include essential emergency information. Also as a result of the procedural weaknesses identified in this report, the security incident commanders were not able to make the correct response decisions. For example, both of the security incident commanders incorrectly

categorized and classified a credible, validated bomb threat at a hazardous material facility as an Operational Emergency not requiring further classification because the existing EALs do not specify emergency classifications based on the potential for a hazardous material release. As a result, the security incident commanders also did not implement timely protective actions for facility or site personnel that could be affected by a hazardous material release caused by an explosive device. Neither incident commander initiated appropriate offsite notifications based on the potential severity of such an event.

Since 1997, the capabilities of initial emergency responders has improved, however, the emergency plan implementing procedures and responder decision-making resources are still inadequate.

In summary, the ability of initial emergency responders to perform the time-urgent duties of emergency categorization/classification and notifications has improved since the 1997 evaluation. This is due in part to revisions in the emergency response organizational expectations and improved classification and notification resources. However, the emergency plan implementing procedures and responder resources still lack sufficient specificity and do not yet provide adequate direction and instruction for implementing emergency response functions. Furthermore, the organizational structure, functions, and interfaces of the various LLNL emergency management program components have not been adequately defined or assigned to an appropriate management level to ensure that a comprehensive program is established and maintained.


Rating: Marginal



Training, Drill, and Exercise Program

The 1997 evaluation identified that training for laboratory emergency duty officers (LEDOs) did not address the major, time-critical tasks for which the LEDO, as the initial decision-maker, was responsible during an emergency. The 1998 follow-up review identified that LLNL had improved the training for LEDOs by increasing the number of performance-based activities such as drills, and that similar training for


incident commanders was pending. This 1999 follow-up review found that there has been a substantial improvement in the training required for the LEDO position, and that the LLNL training, drill, and exercise program has several positive attributes. Nonetheless, there are weaknesses in the program that limit its effectiveness, including inadequate training opportunities for incident commanders to practice critical skills in event assessment, classification and categorization, notifications, and protective action decision-making.

 **The LLNL training, drill, and exercise program contains a number of positive elements.**

The LLNL training, drill, and exercise program contains a number of positive elements. Of particular note is that the past two emergency response exercises were conducted during non-duty hours to test the site's ability to perform critical response functions without the immediate staffing of the emergency management center and to summon personnel from off site in a timely manner. Other examples include procuring outside expertise to train LLNL staff in hazards assessment development; using the training record-keeping system to track drill and exercise participation of emergency response personnel; and documenting the training requirements for the emergency management team, incident commanders, and selected other emergency response personnel in the emergency readiness assurance plan (ERAP). The event recording capabilities of the computer-based "web emergency management center" system have been used to artificially replicate the 1998 emergency response exercise to provide additional exercise training and familiarization opportunities for emergency management center personnel. An LLNL drill/exercise procedures manual describes the elements necessary for an effective drill and exercise program, but its guidance is not being consistently followed in areas such as the development of after-action reports. The June 1999 full participation exercise was well documented, and the exercise package contained the necessary elements, including objectives and supporting evaluation criteria. There is also evidence that the drill and exercise program has resulted in improvements in some areas, such as in the use of the automated computer system for responder communication and coordination.

The much-improved LEDO training program that was developed in response to the 1997 ISME includes

an expanded list of required courses, a required reading element that includes guidance in particular areas of emphasis within each document, and selected emergency response facility tours. In addition, to maintain proficiency, many of the monthly LEDO training sessions have included tabletop drills requiring the participants to determine the categorization and/or classification of an event from a complex set of initial conditions. Although all of the LEDOs are required to attend a course in conservative emergency management decision-making, some LEDOs have not yet attended this training. On the other hand, the training program for the incident commanders, who assumed responsibility for initial categorization, classification, notifications, and protective action decisions in April 1998, does not support these new response duties. Incident commanders have not been provided adequate opportunities to practice their skills in event assessment, categorization, and classification using challenging scenarios and their performance has not been routinely evaluated using an established set of performance standards. For example, over the past year, the four security force incident commanders collectively participated in a single drill session that provided only basic event categorization training. The drills that are conducted for fire department incident commanders are primarily training sessions and do not include activities that permit critical decision-making skills to be practiced under a variety of response conditions. In addition, because feedback is not formally collected from drills, LLNL lacks a mechanism for identifying trends in responder performance and sharing lessons learned from drills with other responders. The incident commanders have not been provided any laboratory-specific training on protective action formulation or the impact of meteorological conditions on the release of hazardous materials and they are not required to attend the training on conservative decision-making that is required of the LEDOs.

 **There is no annual refresher training for incident commanders, emergency management team personnel, or most SOC personnel, as required by DOE Order 151.1.**

Other weaknesses in the training, drill, and exercise programs are also limiting improvements in responder performance. There is no annual refresher training for incident commanders, emergency management team personnel, or most SOC personnel as required by DOE

Order 151.1 to ensure that responder proficiency is maintained. SOC emergency management coordinators specify the minimum training standards for personnel who respond to a particular center, but the rigor and degree of implementation varies across the centers. Most of the training course titles and emergency response organization position titles appearing in the ERAP are not specific to the LLNL emergency management program, and no SOC staff training requirements are identified. Overall, the LLNL emergency preparedness program is limited by the lack of clearly defined and integrated training requirements for all response personnel and incomplete training for some SOC personnel. In addition, no drill or exercise participation requirements have been established for any of the emergency response positions.

As discussed previously, weaknesses in evaluating, documenting, and extracting information from drills and exercises limit their value as a performance feedback mechanism. The June 1999 full participation exercise lacked specific exercise objectives to determine whether the incident commander duties of notification, categorization and classification, and protective action formulation were executed promptly and accurately. Other exercises and drills have not been consistently

documented using a minimum set of standards. The transition to the laboratory-wide database for tracking exercise deficiencies and weaknesses has been slow, as indicated by the fact that weaknesses from the June 1999 exercise have not yet been entered into this system. The drill and exercise program also has not been effective in identifying impediments to responder proficiency, such as the quality of available procedural tools and their use by the incident commanders.

In conclusion, LLNL has implemented several improvements in the training, drill, and exercise program. Noteworthy is management's commitment to exercising the laboratory's emergency response capability during off-normal hours. However, responder performance during the tabletop scenarios conducted as part of this evaluation indicated weaknesses in certain important knowledge areas and an inadequate level of preparation for their immediate response responsibilities. In particular, the insufficient level of drill activity for incident commanders and weaknesses in developing and evaluating drills and exercises are limiting the readiness of site personnel to respond effectively to emergencies.

Rating: Marginal



3.0 Conclusions and Overall Rating





This section presents an overall perspective and rating on the current state of the LLNL emergency management program.

LLNL has made some notable improvements in the site's emergency management system to facilitate timely emergency response decision-making and offsite notifications. The improved ratings for the three program elements discussed in this report are indicative of the fact that some progress toward fully developing these elements has been made to date. However, considering the length of time since the 1997 and April 1998 Office of Oversight evaluations, progress in improving the overall program has been slow and has been limited to a few programmatic elements such as hazards

assessments and training. The Unsatisfactory rating in the Feedback and Improvement area reflects the fact that all but one of the weaknesses identified in this 1999 report have been previously identified during external and internal assessments, but have not yet been addressed or corrected. Additional DOE and LLNL management attention is needed to ensure that the laboratory is fully prepared for and capable of responding to an incident involving the potential or actual release of hazardous materials.

The overall rating of Marginal and the individual element ratings reflect the current status of the emergency management program.

Overall Rating: Marginal 

| Ratings by Report Element | | |
|---|----------------|---|
| Feedback and Continuous Improvement Process | Unsatisfactory |  |
| Hazards Surveys and Hazards Assessment | Marginal |  |
| Program Administration, Plans, and Procedures | Marginal |  |
| Training, Drill, and Exercise Program | Marginal |  |

4.0 Opportunities for Improvement

The follow-up review conducted by the Independent Oversight team identified several opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE and contractor line managers and prioritized and modified as appropriate, in accordance with site-specific programmatic and emergency management objectives.

- Revise the OAK/AMLS issues management procedure to clarify requirements for managing both DOE and LLNL corrective action commitments and to define mechanisms for documenting closure and verifying the effectiveness of completed corrective actions.
- Reconcile differences between the AMLS standard operating procedure for emergency management oversight and the annual and quarterly operational awareness implementation plans regarding the frequency, content, and rigor of emergency management program element reviews. Ensure that the quarterly operational awareness implementation plan reflects the level of detail necessary to provide effective oversight, including the examination of past weaknesses and continuous improvement efforts.
- Reinforce interim expectations for conducting and documenting Livermore Site Oversight Division operational awareness activities. Establish and implement mechanisms to communicate the status of the site's emergency management program to senior LLNL managers on a routine and periodic basis.
- Clearly define the roles, responsibilities, authorities, and interfaces among all elements of the LLNL emergency management system and establish a mechanism to ensure that the planning, preparedness, and response functions that cross-cut many laboratory organizations are effectively implemented, integrated, and demonstrated.
- Identify a specific LLNL manager with overall authority and accountability for the closure and verification of all corrective actions related to emergency management.
- Develop and implement a rigorous LLNL process that, in an expedited manner, identifies all of the weaknesses discussed in the 1997 ISME emergency management field report, the 1998 and 1999 emergency management follow-up reports, and other internal and external assessments, and ensures that they are verified to have been effectively addressed, are currently a part of an existing corrective action plan, or are captured and addressed in a new or revised corrective action plan.
- Develop and implement an LLNL emergency management assessment strategy beyond the drill and exercise program that prioritizes areas for review, incorporates specific evaluation criteria, and uses independent assessors who are subject matter experts.
- Improve the quality of the hazards assessment to ensure that it provides the planning, preparedness, and response basis for the full spectrum of accidents that may affect LLNL facilities and activities. Develop a mechanism to ensure that hazards assessors and emergency planners are notified in advance by cognizant facility and activity personnel of significant changes in hazardous materials inventories, processes, and activities at LLNL facilities.
- Implement interim emergency classification and protective action decision-making guidance related to transportation incidents and security events through application of the North American Emergency Response Guide, fixed facility release scenarios, and discretionary emergency action levels as response tools.
- Prepare/revise emergency response procedures to permit prompt and accurate decision-making

during the critical, early stages of event response, particularly in the areas of consequence assessment, protective actions, categorization and classification, and notifications. Strictly validate these procedures to ensure that they accurately reflect expectations for performing emergency response actions in the field and are structured in a manner that facilitates easy implementation in a high-stress, time-urgent environment.

- Develop and implement initial notification mechanisms and procedures that permit prompt notification of applicable organizations following event categorization or classification under all circumstances. Ensure pertinent notification information is accurately collected at the scene and in emergency response facilities and is included in notifications to DOE Headquarters and offsite agencies.
- Consider implementing an emergency response command structure that assigns the senior fire protection officer the responsibilities for hazardous material release assessment (actual or potential), protective action formulation, categorization/classification, and emergency notifications regardless of the nature of the event.
- Provide incident commanders with training on the purpose, terminology, formulation, and communication of protective actions, as well as the impact of meteorological conditions on hazardous material releases, to ensure prompt and accurate dissemination of strategies during the critical, early stages of event response.
- Increase the frequency and difficulty of performance-based training activities for incident

commanders to verify the effectiveness and usage of implementing procedures and to improve proficiency in the areas of event assessment, categorization and classification, and formulation of protective actions.

- Review, update, and fully implement the provisions of the “Drill and Exercise Procedures Manual” for planning, conducting, evaluating, and documenting drills and exercises. Include processes and clear expectations for resolving and tracking drill and exercise evaluation comments; verifying the effectiveness of completed corrective actions; and sharing drill and exercise results and corrective actions with emergency response personnel.
- Clearly define and document the training, drill, and exercise participation requirements for all emergency response personnel. These requirements should be based on a systematic analysis of the duties of each responder and addressed through an appropriate mix of classroom and performance-based activities conducted on a periodic basis.
- Develop annual refresher training activities that are clearly value-added to emergency responders. Consider topics such as annual updates of programmatic documents, lessons learned from past exercises and performance-based training activities, and reviews of specific responder duties having particular importance or difficulty.
- Develop drills for SOC personnel that are designed to demonstrate and maintain their proficiency and to test the effectiveness of actions taken to correct previously identified weaknesses and improvement items.

APPENDIX A

FINDINGS FOR CORRECTIVE ACTION AND FOLLOW-UP

This appendix summarizes the significant findings identified during the Office of Independent Oversight and Performance Assurance follow-up review of the Lawrence Livermore National Laboratory emergency management program. The findings identified in this appendix will be formally tracked in accordance with the *Protocols for Responding to Office of Independent Oversight and Performance Assurance Appraisal*

Reports (August 1999) and will require a formal corrective action plan. The DOE Assistant Secretary for Defense Programs and the Oakland Operations Office need to specifically address these findings in the corrective action plan. Line management should address other weaknesses and/or deficiencies identified in this report, but they need not be included in the formal corrective action plan.

| FINDING STATEMENT | REFER TO PAGES: |
|--|-----------------|
| 1. LLNL assessment and corrective action management programs have not ensured that previously identified emergency management program weaknesses have been successfully addressed and corrected. | 6-8 |
| 2. OAK and AMLS have not adequately monitored LLNL progress in improving the laboratory emergency management program, communicated expectations for program quality and improvement, or held the laboratory accountable for improving the program and correcting previously identified weaknesses. | 8-9 |
| 3. The LLNL emergency planning, preparedness, and response program elements have not been adequately defined and integrated into a management system that ensures effective implementation and an appropriate level of management attention and support. | 11-12 |
| 4. LLNL emergency response procedures and decision-making resources do not provide adequate definition or instruction for initial responders to promptly and accurately categorize and classify an emergency, and formulate and implement protective actions. | 12-13 |
| 5. The LLNL emergency notification process does not ensure that DOE Headquarters and offsite agencies are promptly notified of essential emergency information and is inconsistent with DOE Order 151.1 requirements. | 13 |

OPEN LEGACY ISSUE

The hazards analyses that support the LLNL emergency management program, including methodology, scope, and documentation, are not performed with sufficient rigor to ensure that the laboratory is able to respond to the full spectrum of potential operational emergencies. LLNL has not established formal work processes, methodologies, or procedures to govern the conduct of these analyses. Sitewide processes are not formally linked to facility source documents, such as safety analysis reports and process hazards analyses. The Emergency Plan Implementing Procedures are outdated and inconsistent with existing requirements and site conditions, some procedures are not sufficiently detailed to ensure that emergency managers can perform time-sensitive response to off-normal events, and some procedures have not been reviewed and approved by DOE as required.


APPENDIX B

EVALUATION PROCESS AND TEAM COMPOSITION


The evaluation was conducted under the direction of the Secretary of Energy's Office of Independent Oversight and Performance Assurance. The evaluation was performed according to formal protocols and procedures, including an Appraisal Process Guide, which provides the general procedures used by Independent Oversight to conduct inspections and reviews, and the evaluation plan that was developed specifically for this activity, which outlines the scope and conduct of the process. Planning discussions were conducted to ensure that all team members were informed of the review objectives, procedures, and methods.

Explanation of Rating System


The Office of Independent Oversight and Performance Assurance assigns an overall rating to the emergency management program; ratings are also assigned to selected individual elements of the program. The rating process involves the critical consideration of all evaluation results, particularly the identified strengths and weaknesses. In the case of weaknesses, the importance and impact of those conditions is analyzed both individually and collectively, and balanced against any strengths and mitigating factors to determine their impact on the overall goal of protecting emergency responders, site workers, and the public. The Office of Independent Oversight and Performance Assurance uses three rating categories—Satisfactory, Marginal, and Unsatisfactory—which are depicted by colors as green, yellow, and red, respectively.

 **Satisfactory** (Green): An overall rating of *Satisfactory* is assigned when the emergency management program being evaluated provides reasonable assurance that all of the site's emergency responders are ready to respond promptly and effectively to an emergency event or condition.

An emergency management element being evaluated would normally be rated Satisfactory if the emergency management function is effectively implemented. An element would also normally be rated as Satisfactory if, for any applicable standards that are not met, other compensatory factors exist that provide equivalent protection to workers and the public, or the impact is minimal and does not significantly degrade the response.

 **Marginal** (Yellow): An overall rating of *Marginal* is assigned when the emergency management program being evaluated provides questionable assurance that site workers and the public can be protected following an emergency event or condition.

An emergency management element being evaluated would normally be rated Marginal if one or more applicable standards are not met and are only partially compensated for by other measures, and the resulting deficiencies in the emergency management function degrade the ability of the emergency responders to protect site workers and the public.

 **Unsatisfactory** (Red): An overall rating of *Unsatisfactory* is assigned when the emergency management program being evaluated does not provide adequate assurance that site workers and the public can be protected following an emergency event or condition.

An emergency management element being evaluated would normally be rated Unsatisfactory if one or more applicable standards are not met, there are no compensating factors, and the resulting deficiencies in the emergency management function seriously degrade the ability of the emergency responders to protect site workers and the public.

Team Composition

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